

What Is Claimed Is:

1. A gypsum facing material comprising:
a randomly oriented open mesh filament network substantially impregnated with a first binder resin; and
5 a reinforcing agent applied to said open mesh filament network to improve the stiffness and/or the openness of the mesh;
a secondary binder resin applied to said randomly oriented open mesh filament network at a
10 viscosity sufficient to prevent full penetration of said secondary coating within said impregnated randomly open mesh filament network, said secondary binder resin comprising at least one filler.
2. The gypsum facing material of claim 1,
15 wherein said reinforcing agent is applied with said secondary binder.
3. The gypsum facing material of claim 1, wherein said secondary binder resin comprises a fairly low glass transition organic binder.
- 20 4. The gypsum facing material of claim 3, wherein said secondary binder resin further comprises a small level of a crosslinking agent.
5. The gypsum facing material of claim 3, wherein said secondary binder resin further comprises a
25 small level of a thermosetting resin.
6. The gypsum facing material of claim 3, wherein said secondary binder resin further comprises a

small level of a crosslinking agent and a small level of a thermosetting resin.

7. The gypsum facing material of claim 1, wherein said fairly low glass transition organic binder
5 comprises at least 6 percent of the total weight of said secondary binder resin.

8. The gypsum facing material of claim 7, wherein said fairly low glass transition binder comprises between about 7 and 10 percent of the total
10 weight of said second binder resin.

9. The gypsum facing material of claim 1, wherein said at least one filler comprises at most approximately 65 percent of the total weight of said secondary binder resin.

10. The gypsum facing material of claim 3, wherein said fairly low glass transition organic binder
15 comprises an acrylic based resin.

11. The gypsum facing material of claim 3, wherein said fairly low glass transition organic binder
20 comprises a styrene-butadiene-rubber based resin.

12. The gypsum facing material of claim 1, wherein said at least one filler is selected from the group consisting of calcium carbonate, aluminum hydroxide, zinc oxide, mixed oxides, iron oxides,
25 chromates, glass beads, silicates, clay, sand, and combinations thereof.

13. The gypsum facing material of claim 1, wherein said at least one reinforcing agent comprises a fibrous reinforcing agent.

14. The gypsum facing material of claim 1, wherein said at least one reinforcing agent comprises a needle like reinforcing agent.

15. The gypsum facing material of claim 1,
5 wherein said at least one reinforcing agent is selected from the group consisting of wollastonite, wood fibers, cellulose, lignin, polypropylene fibers, polyester fibers, glass fibers, gypsum, Chalcedony, acicular man made fibers, metallic wools, steel wool, mica, and
10 combinations thereof.

16. The gypsum facing material of claim 1 further comprising a low basis secondary veil layered onto said randomly oriented open mesh filament network.

17. The gypsum facing material of claim 16,
15 wherein said low basis secondary veil comprises a plurality of glass fibers, polymeric fibers, or a mixture thereof, said fibers having a length sufficient to bridge each of a plurality of pores defined within said randomly oriented open mesh filament network.

20 18. The gypsum facing material of claim 17, wherein said fibers comprise glass fibers, and said glass fibers are covered by a coating.

19. The gypsum facing material of claim 17, wherein at least one of said plurality of polymeric
25 fibers is selected from the group consisting of polyester fibers, flame retardant polyesters fibers, flame retardant polyolefin fibers, and polyolefin fibers.

20. The gypsum facing material of claim 1,
wherein said first binder resin makes a stable emulsion
in water and is selected from the group consisting of a
melamine-based resin, a urea-formaldehyde-based resin,
5 an acrylic based resin, and a modifying resin.

21. The gypsum facing material of claim 1,
wherein said randomly oriented open mesh filament
network comprises a plurality of wet use chop strands.

22. The gypsum facing material of claim 19,
10 wherein at least one of said plurality of wet use chops
strands comprises Owens Corning's 9501 Advantex® glass
filaments.

23. The gypsum facing material of claim 1
further comprising:
15 a plurality of high aspect ratio particles
introduced to said first binder resin prior to the
introduction of said secondary binder resin.

24. The gypsum facing material of claim 23,
wherein said plurality of high aspect ratio particles
20 is selected from the group consisting of wollastonite,
wood-based fibers, polymeric fibers, cellulose, lignin,
polypropylene fibers, polyester fibers, glass fibers,
gypsum, Chalcedony, acicular man-made fibers, metallic
wools, steel wool, mica and combinations thereof.

25. The gypsum facer material of claim 1,
wherein said randomly oriented open mesh filament
network is formed in a first headbox, and said
reinforcing agent is applied to said network in a
second headbox.

26. The gypsum facer material of claim 1,
wherein said randomly oriented open mesh filament
network is formed in a headbox, and said reinforcing
agent is applied to said network with a brushy roller
5 system.

27. The gypsum facer material of claim 3,
wherein said secondary binder resin further comprises
an inorganic binder.

28. The gypsum facer material of claim 27,
10 wherein said inorganic binder comprises a compound
selected from the group consisting of calcium oxide,
calcium silicate, calcium sulfate, magnesium
oxychloride, magnesium oxysulfate, aluminum hydroxide
and portland cement.

29. A method for forming a gypsum facer
15 comprising:

forming a randomly oriented open mesh
filament network;

optionally applying at least one reinforcing
20 agent to said open mesh filament network prior to
adding any binder;

impregnating said randomly oriented open mesh
filament network with a first binder resin to form a
wet formed permeable precursor mat;

25 applying at least one reinforcing agent to
said open mesh filament network;

coating said wet formed permeable precursor
mat with a secondary coating, said secondary coating
comprising a low glass transition organic binder and at
30 least one filler; and

drying said coated wet formed permeable precursor mat within a drier at a temperature sufficient for said first binder resin to form a film.

30. The method of claim 29, further comprising the step of providing said secondary coating with a viscosity sufficient to prevent full penetration of said secondary coating within said randomly oriented open mesh filament network

31. The method of claim 30, further comprising:

forming a low basis secondary veil, said low basis secondary veil comprising a plurality of polymeric fibers having a length sufficient to bridge each of a plurality of pores defined within said randomly oriented open mesh filament network; and

layering said low basis secondary veil onto said randomly oriented open mesh filament network prior to impregnating said precursor matting with said first binder resin.

32. The method of claim 31, wherein forming a randomly oriented open mesh network, forming a low basis secondary veil, and layering said low basis secondary veil onto said randomly oriented open mesh network comprises:

introducing a whitewater dispersion to a first headbox, said whitewater dispersion comprising a plurality of wet use chop strands;

applying a layer of a randomly oriented fiber network from said first headbox;

applying a layer of a low basis secondary veil from a second headbox onto said layer of said randomly oriented fiber network to form a precursor

matting, said low basis secondary veil comprising a plurality of polymeric fibers having a length sufficient to bridge each of a plurality of pores defined within said randomly oriented open mesh
5 filament network.

33. The method of claim 29 further comprising introducing a plurality of high aspect ratio particles to said wet formed permeable precursor mat prior to coating said wet formed permeable precursor
10 mat with a secondary coating, said plurality of high aspect ratio particles having an average particle size sufficient to bridge each of a plurality of pores defined within said randomly oriented open mesh filament network.

15 34. The method of claim 33, wherein said plurality of high aspect ratio particles is selected from the group consisting of wood-based fibers, and polymeric fibers.

35. The method of claim 29, wherein said
20 first temperature is between approximately 400 and 600 degrees Fahrenheit.

36. The method of claim 29, wherein said at least one reinforcing agent is applied with said secondary coating.

25 37. The method of claim 29, wherein said secondary binder system further comprises an inorganic binder.

38. A method for forming a decorative, high strength gypsum board comprising:

forming a randomly oriented open mesh filament network;

impregnating said randomly oriented open mesh filament network with a first binder resin to form a
5 wet formed permeable precursor mat;

coating said wet formed permeable precursor mat with a secondary coating at a viscosity sufficient to prevent full penetration of said secondary coating within said randomly oriented open mesh filament
10 network, said secondary coating comprising a low glass transition organic binder, at least one filler, and at least one reinforcing agent;

placing said coated wet formed permeable precursor mat within a float drier at a temperature
15 sufficient to allow said first binder system to form a coating, therein forming a gypsum facing material;

introducing a gypsum core material to a first layer of said gypsum facing material;

introducing a second layer of said gypsum facing material to said gypsum core material such that
20 said gypsum core material is located between said first layer and said second layer; and

allowing said gypsum core material to set between said first layer and said second layer.

25 39. The method of claim 38, further comprising:

forming a low basis secondary veil, said low basis secondary veil comprising a plurality of polymeric fibers having a length sufficient to bridge
30 each of a plurality of pores defined within said randomly oriented open mesh filament network; and

layering said low basis secondary veil onto said randomly oriented open mesh filament network prior

to impregnating said precursor matting with said first binder resin.

40. The method of claim 39 further comprising introducing a plurality of high aspect ratio particles to said wet formed permeable precursor mat prior to coating said wet formed permeable precursor mat with a fairly low glass transition secondary coating, said plurality of high aspect ratio particles having an average particle size sufficient to bridge each of a plurality of pores defined within said randomly oriented open mesh filament network.

41. The method of claim 37, wherein said secondary binder system further comprises an inorganic binder.

42. A method for forming a gypsum facer comprising:

forming a randomly oriented open mesh filament network;

impregnating said randomly oriented open mesh filament network with a first binder resin to form a wet formed permeable precursor mat such that said plurality of high aspect ratio particles are contained between said randomly oriented open mesh filament network and said first binder resin;

introducing a plurality of high aspect ratio particles onto said randomly oriented open mesh network from a brushy roller system;

optionally coating said wet formed permeable precursor mat with a low viscosity, low glass transition temperature organic secondary binder;

optionally coating said wet formed permeable precursor mat with a secondary coating, said secondary

coating comprising a low glass transition organic binder, at least one filler, and at least one reinforcing agent; and

5 placing said coated wet formed permeable precursor mat within a float drier at a temperature sufficient for said first binder resin to form a film.

43. The method of claim 42, wherein said plurality of high aspect ratio particles having an average particle size sufficient to bridge each of a
10 plurality of pores defined within said randomly oriented open mesh filament network.

44. The method of claim 42, wherein said plurality of high aspect ratio particles is selected from the group consisting of wood-based fibers and
15 polymeric fibers.

45. A method for forming a gypsum facer
comprising:

forming a randomly oriented open mesh filament network;

20 impregnating said randomly oriented open mesh filament network with a first binder resin to form a wet formed permeable precursor mat such that said plurality of high aspect ratio particles are contained between said randomly oriented open mesh filament
25 network and said first binder resin;

introducing a plurality of high aspect ratio particles onto said randomly oriented open mesh network from a brushy roller system;

30 optionally coating said wet formed permeable precursor mat with a low viscosity, low glass transition temperature organic secondary binder; and

drying said coated wet formed permeable precursor mat sufficiently for said binder resin to form a film.

46. The method of claim 45, wherein said
5 plurality of high aspect ratio particles having an average particle size sufficient to bridge each of a plurality of pores defined within said randomly oriented open mesh filament network.

47. The method of claim 45, wherein said
10 plurality of high aspect ratio particles is selected from the group consisting of wood-based fibers and polymeric fibers.

48. A method for forming a gypsum facer
comprising:

15 forming a randomly oriented open mesh filament network;

introducing a low basis secondary veil layered onto said randomly oriented open mesh filament network to form a permeable precursor mat;

20 impregnating said permeable precursor mat with a first binder resin to form a wet formed permeable precursor mat;

applying at least one reinforcing agent to said permeable precursor mat;

25 optionally coating said wet formed permeable precursor mat with a low viscosity, low glass transition temperature organic secondary binder; and

drying said impregnated wet formed permeable precursor mat sufficiently for said first binder resin
30 to form a film.

49. The gypsum facing material of claim 48,
wherein said low basis secondary veil comprises a
plurality of polymeric fibers having a length
sufficient to bridge each of a plurality of pores
5 defined within said randomly oriented open mesh
filament network.

50. The gypsum facing material of claim 49,
wherein at least one of said plurality of polymeric
fibers is selected from the group consisting of
10 polyester fibers, flame retardant polyesters fibers,
flame retardant polyolefin fibers, and polyolefin
fibers.